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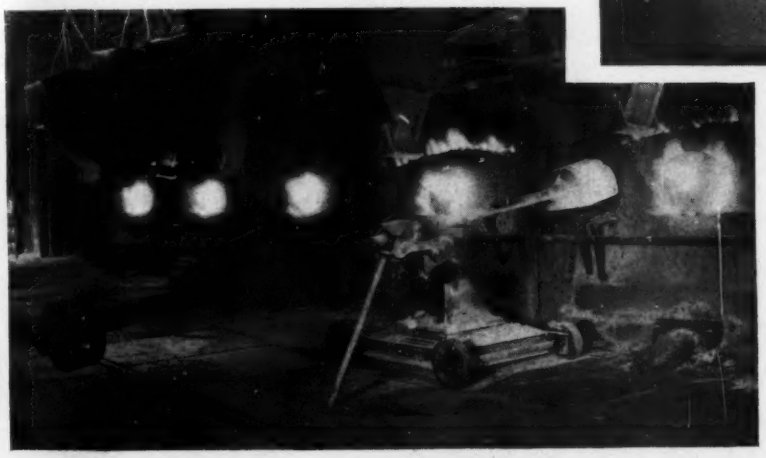
GLASS AND THE MACHINE AGE[1]

New Mechanical Processes Have Increased Production and Lowered Costs

By ALBERT A. HOPKINS

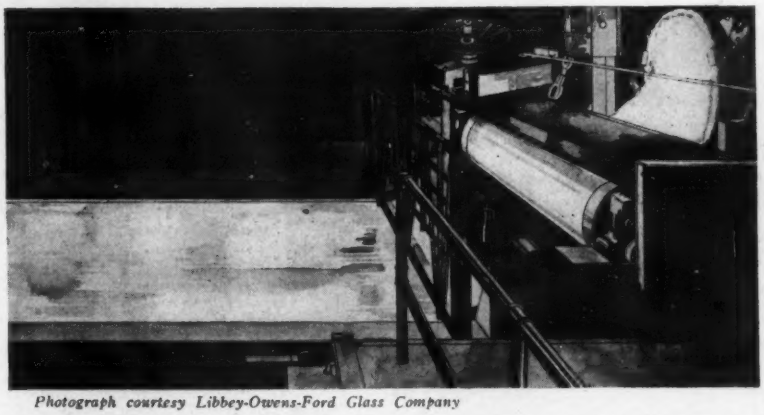


IN THE ROLLER CASTING PROCESS, GLASS IS MELTED IN LARGE HAND-MADE CLAY POTS

LEFT: THE "BATCH" IN CLAY POTS IS MELTED IN FURNACES USING GAS AS FUEL

A FEW years ago the writer visited various glass plants and was astonished at the crude methods which were used in both plate and window glass factories. It really seemed a miracle that there was any product at all. Another visit of inspection only a few months ago showed a marked change, for glass manufacture had entered the machine age. We have at various times described the manufacture of blown glass, bottles, tubing, and plate glass. We will now consider only plate and flat-drawn window glass and safety glass for automobiles. Another great field for glass is for actual building construction but that will be another story—a few years hence.

The raw materials that go into glass manufacture must be pure, and this is assured by constant inspection, care and chemical tests. When hundreds of tons of silica sand and

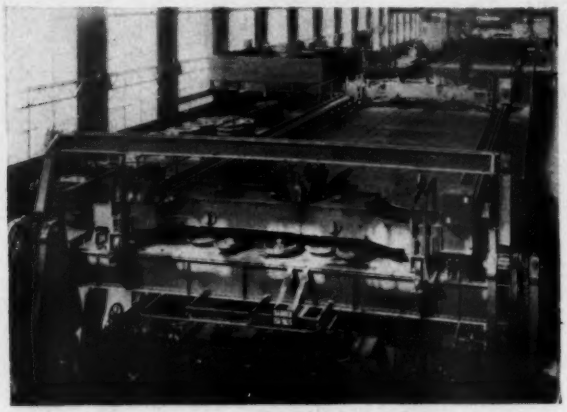


Photograph courtesy Libbey-Owens-Ford Glass Company

AFTER THE BATCH IN THE POTS IS MELTED IT IS CAST THROUGH ROLLERS ON THE MOVABLE CASTING TABLES, PRODUCING AN UNPOLISHED BLANK OF PLATE GLASS

[1]Reprinted by courtesy of the author from *The Scientific American*, May, 1932.

other materials are consumed daily the problem of inspection naturally looms large. The great companies have sand pits or quarries as near as possible to their plants—quality permitting. The Allegheny Valley in Pennsylvania may be termed the center of the industry although glass sand is found in 30 states. The "batch," as it is called, is composed of silica sand, soda ash, limestone, salt cake, charcoal, arsenic, and "cullet" (pieces of broken glass). The ingredients are processed and reduced to proper fineness, for the quality of the glass depends upon the care with which the component parts are mixed.



MACHINES GRIND AND POLISH THE BLANKS; AT THE END OF ITS JOURNEY THE GLASS IS TURNED, RESET, AND THE OTHER SIDE WORKED

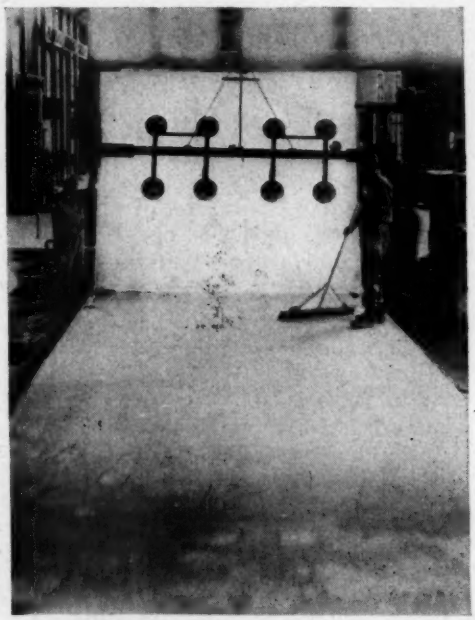
There are two methods of plate glass manufacture. For large sizes of glass such as used in store fronts and very large windows the Bicheroux-pot casting process is used. Plate glass blanks for smaller sizes such as are used in automobiles and mirrors are made by the tank drawing process.

In the pot casting process the pots are fabricated by hand as it has never been found practical to make them by machinery. The finest quality of imported and domestic clays are dried, aged, and cured. The pots are built up by expert workmen out of balls of wet clay. The pots are preheated in a pot kiln before being placed in the gas-heated melting furnace. The well-mixed batch is then fed into the pot, the front of the furnace is closed, and the mixture is then subjected to a high temperature from 24 to 30 hours. The firing is done scientifically by experts. At the proper time the pot is removed from the furnace and conveyed to the Bicheroux casting machine. The molten batch is poured through rollers onto a moving table, forming the unfinished plate glass blank. The blank then passes from the casting table through a long annealing lehr where under gradually diminishing heat the glass is carefully tempered. This precision in annealing or tempering is another important contributing factor to high quality in plate glass.

After emerging from the lehr the blanks are given their first inspection. The glass at this point has a rough surface and is hardly transparent, but it is ready for the grinding and polishing operations. Owing to the rather heroic treatment to which the glass blank is submitted in the grinding and polishing operation it must be held firmly in plaster on the metal table. The visitor observes what seems at first to be a manhandling of the glass but it is really a "foot operation" which answers much better than do machines which have been devised for the same work. The table is flowed with plaster of Paris, the glass blank is laid on it, and men with wooden soled shoes tramp back and forth over the surface of the glass, forcing an even distribution of the plaster.

THE GROUND AND POLISHED GLASS IS CUT INTO CONVENIENT LENGTHS AND EXAMINED BY EXPERTS FOR EVEN MINOR DEFECTS

The rough plate is now firmly held in plaster on a long line of moving tables. These tables pass under a series of rotating and oscillating grinders using sand as an abrasive until the rough surface is ground down to the point where it is smooth enough to be polished. The moving table passes on under another series of rotating felt polishers where, using rouge as the polishing agent, the glass finally

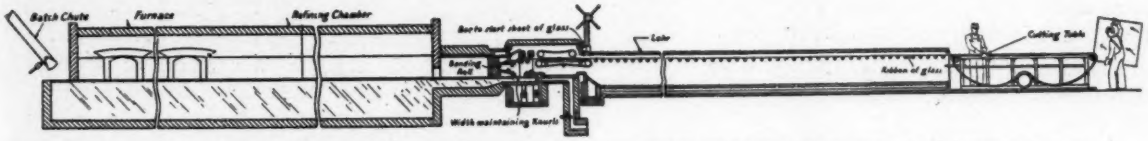


SHEETS OF GLASS ARE HANDLED AND TURNED MECHANICALLY WITH THE AID OF SUCTION DISKS

THE MATERIALS ARE WEIGHED OUT AND MIXED AND ARE SHOT INTO THE FURNACE FROM THIS CHUTE

ally settled or refined preparatory to entering the shallow drawing pot from which the sheet is drawn. Here the proper degree of heat is maintained for the ultimate formation of the sheet.

The molten glass is elevated or drawn a few inches and then passes over a bending roll, still in a semi-molten state, onto a flattening table. As the glass is raised from the fire chamber the natural fire finish is applied to both sides of the sheet. Leaving the flattening table and slowly hardening, the glass is moved horizontally, perfectly flat at all times, into a long annealing oven or lehr more than 200 feet in length. The gradual annealing under a scientifically regulated and steadily diminishing temperature tempers the glass, leaving it free from internal strain and giving it that uniform strength and freedom from brittleness which makes this glass so easy to cut, which is done with a diamond.



SHEET-DRAWN FLAT AND PLATE GLASS IS MADE IN A CONTINUOUS PROCESS, THE FURNACE RUNNING FOR LONG PERIODS. PATH OF THE GLASS IS SHOWN

emerges several hours after it has entered the grinding and polishing machines with one side completely ground and polished. About thirty grades of abrasive and polishing agents are employed. After further inspection the plate is mechanically lifted and turned to start again the long journey back through another grinding and polishing machine which finishes the reverse side. On emerging from this machine the plate is thoroughly washed, and then delivered to the final inspection department. Here it is graded and inspected.

The old process of making window glass was crude in the extreme. The molten glass was blown into hollow cylinders which were fabricated by skilful heating, blowing, reheating, and dexterous manipulations. The ends were removed from the cylinders, which were then split longitudinally, and the glass was flattened out. This process gave a sheet of glass that was only approximately flat and the spoilage was large. This process was used until 1903 when a machine for blowing the cylinders was developed. It was a great advance but there remained all the defects of "cylinder glass." Experiments on making a flat sheet direct had been carried on since 1857 but it was reserved for an American inventor, Irving W. Colburn, to develop a workable machine for producing commercial flat-drawn sheet glass.

In the flat glass process both plate and window glass can be produced, the principle being the same. The preliminary operations are very similar to those employed in other forms of glass manufacture. The "batch" is shot into the horizontal furnace through chutes where it is melted under a heat of 2500 degrees, Fahrenheit. This operation is a continuous one running uninterruptedly for months and in some cases years. The furnace contains from 600 to 900 tons of molten glass. The molten glass passes from the melting chamber to the refining chamber where it is gradu-

THE MOLTEN GLASS PASSING OVER A BENDING ROLL TO A FLATTENING TABLE

The question may arise as to how the glass is started on its continuous course. The machine is reversed and a mechanical "bait," consisting of a flat iron bar three inches wide and about six feet long, is attached to strips of flexible metal that allow the bait to pass over the bending roll down into the glass. Then the machine is started in its forward motion, pulling the bait with its adhering mass of plastic glass over the bending roll onto the horizontal flattening table and thence into the lehr. The bait is cracked off and the pilotless continuous sheet of glass passes endlessly into the lehr.

When the glass leaves the lehr it is cut into sheets of suitable size, dipped in acid and distributed to cutting stalls.

Structural Glass Has Arrived

By J. W. WILEY[1]

GLASS of the transparent and translucent variety has served mankind in many vitally important ways since the days when Egyptian civilization was in the zenith of its glory.

Glass has an ancient and honorable record. It has contributed greatly to our health, comfort and happiness. It has been the medium in windows and doors through which light and sunshine have been admitted to chase away darkness and gloom and also prevent disease.

Glass is contributing beauty of rare form and color in vases and in many objects developed as specialties in connection with modern art. It is now being produced in the form of beautiful grills, roundels, plaques and other ornamental and decorative elements for structural use.

The value and general efficiency of glass for its customary uses is so well known, and so fully accepted that little need be said about them.

There is another material known quite generally as so-called structural glass, for want, largely, of a better descriptive term. This is fast becoming a recognized standard for many of the purposes for which marble and clay tile have for centuries been considered indispensable. This is the particular kind of material, which is opaque, that we shall deal with in this article.

Like most manufactured materials, structural glass has passed through various stages of evolution. When first produced some 25 years ago, it was used chiefly for advertising signs, refrigerator linings and shelves in 5/16" thickness. Later, it was produced in various thicknesses up to 1" and found favor first as table tops in lunch rooms, restaurants and cafeterias, mainly in the ¾" thickness.

Coincident with the development of this use, it was also adopted for top slabs on cafeteria, lunch and soda fountain counters, in the 1" thickness. It was later applied to the fronts of counters and for the base and frieze.

Today, so-called structural glass counters are being widely used and are decorative, colorful and artistic.

Then began a period of development embracing the adaptation of this material for the walls of bathrooms, kitchens and pantries in residences and for the walls and compartment partitions in the toilet rooms of office and public buildings, theatres and hospitals; also, for the walls of creameries, dairies, laboratories, restaurants, lunch rooms and cafeterias.

It was sold through dealers in the early days, even in cases where it was utilized for structural purposes. At this juncture, it might be explained that on the basis of use, the sales were divided into two broad classifications; one covering the application to fixtures comprising uses not requiring the installation as part of the building, and the other in which installation of material was necessary.

An inadequate knowledge of the material itself as well as the technique of installation on the part of its dealers led one large company to adopt the policy of organizing and maintaining in all of the principal cities of the United States, as well as abroad, selling and operating construction companies independently financed and owned yet unified and controlled by a general sales policy of the manufacturer.

These organizations include practical men, skilled in the proper handling and installing of this class of material and who, naturally, are conversant with the local labor practices. The other large manufacturer in this field operates on the same principle but has his own branches.

This policy protects the ultimate user and affords the architect and owner a dependable service assuring a proper installation in all cases.

To begin with, and for many years afterwards, white material only was produced. It was sold, primarily on the basis of its being the means through which scientific sanitation might be maintained. The prospective user in the early days was first convinced of the necessity for sanitation and then the fact that the material completely met the needs of it.

The education of the public has brought about a change in this program. The public demands sanitation as a fundamental necessity, and the buyer naturally sees to it that its needs are adequately met. It is no longer necessary to emphasize or stress the idea of cleanliness, but rather to be able to offer a material that is easy to keep permanently in that condition.

The day has also gone forever when great expanses of white wall areas in public eating places are acceptable either with, or without decoration; even in color. This, for the reason that people now realize that a thing does not need to be white to be sanitary and further that color is more pleasing and natural.

This affords possibilities for many original and pleasing designs for wainscot caps, decorative band courses, pilasters, pilaster caps, decorative panels and roundels. Then, too, new and very impressive effects may be secured by penetrating the material to a depth of three-eighths to half an inch and thus obtaining the value of sinkage or relief; a whole pattern may be worked out in this manner. Open grills may now be had also of rare beauty and effectiveness, and used for radiator enclosures and inlet and outlet ducts, or simply as ornamental panels.

Structural glass may now be had in plain or decorated form. The decorating is accomplished by means of treating the surface by a process which makes it slightly dulled, gray quality. Color is then applied by hand and set. The results are in substance the equivalent of hand-painted work. Any design, classic, modern or purely idealistic may be outlined on the material and used either with or without the addition of color. Some very subdued and yet very effective results may be secured by utilizing just the contrast values of the polished and dull tone areas, the latter being of a gray tone.

A number of very beautiful colors may now be had in

[1]The Vitrolite Company, New York, N. Y.

structural glass—in tints of blue, orchid and jade green, and also ivory, gray and black. Using these in combination with the die of a wainscot in one color and a cap and base of another offers the possibility of some very attractive results.

Last year one company in the field brought out a beautiful new agate material having a fantastic tracery of lighter colors running through a background of darker ones of another hue. In producing this material the company did not attempt to simulate marble, but rather on the other hand, to produce something that had the mark of distinct individuality. The formation of the tracery in this material is purely accidental and therefore each panel is different in respect to it, yet all are more or less alike in color tone and general character. The agate material may be had in several different color tones; ebony, orchid, walnut, jade, emerald and yellow. The color contrasts are subdued and harmonious and very novel and effective.

This class of material is well adapted for wainscoting in vestibules and entrance lobbies, foyers, elevator lobbies and corridors; particularly, in combination with bronze or either chromium steel or Alleghany metal; the latter, naturally, being used in the form of stiles, or rails. Some very interesting and pleasing treatments may be had in this way. This new agate is now recognized for a wide range of application well nigh comparable with those of marble as well as tile.

The majority of representative architects have found in structural glass something refreshingly new and distinctly different in style and appearance and which is beautiful and practical.

It has inherent advantages since it cannot craze, stain, discolor or deteriorate through contact with ordinary chemicals, and this makes it adaptable for use for store fronts and building facades, as the elements have no effect upon it. Rather than becoming a liability from the standpoint of appearance, through the loss of polished surface and staining, it becomes a permanent asset, because it successfully resists the inroads of rain, heat, cold and acid atmosphere.

Stretching from coast to coast, through the country, structural glass has come into its own as a modern efficient, economical material of beauty. In the city of New York, particularly, where little experimenting is done with materials, it has been used in many of the finest buildings including the highest one in the world, the Empire State Building, the toilet partitions throughout of which are made of it.

This applies also to the new home office building of the Metropolitan Life Insurance Company of New York, the Mutual Benefit Life Insurance Company of Newark, New Jersey, the Bankers Trust Annex, New York and the Payne Whitney Gymnasium of Yale University, New Haven, Connecticut, in which latter case it was used to line the walls of both the exhibition and practice pools.

Structural glass has also been used in the famous Graybar Building in New York, the Chanin, Bowery Savings Bank, Pershing Square Building, New York Central R.R. office building, Lincoln Building, the Salmon Tower, 500 Fifth Avenue Building, One Park Avenue, New York Life, Consolidated Gas Company, Bank of Manhattan, Wall and Hanover Building, the new Cities Service structure, the Russell Sage Foundation and is being installed in the Rockefeller Center group. All of these buildings are very large and representative ones. This type of material has also been used in many of New York's fine new theatres and residences as well as in markets and dairies.

The manufacturers of structural glass are equipped to offer a complete and comprehensive service to the architects or prospective users of this product and collaborate with them in the matter of originating interesting designs and treatments, submitting sketches when requested to do so.

The Manufacture of Rolled Plate

By ERNST LUTZ*

(*Continued from the August, 1932, issue*)

To keep slags and unmolten parts from the chambers 12 which extend above and below the level of the glass mass in the furnace, the hollow baffles 35 are positioned between the boxes and the furnace. The inner walls of these baffles facing the hearth of the furnace extend above the level of the molten glass which finds access from below into the baffles 35 and rises to flow over the walls 36 into the chambers 12.

According to the German patent specification 510503 of Adolf Schild of Furth i. Wald, Bavaria, in contrast to the patents described above the glass mass in the crotch between the two rolls is to have the same level as the molten glass in the furnace. (Figs. 257 and 258). Thereon the rolls can be positioned closer to the spout of the furnace and the glass on the rolls can be kept in more direct connection with the oncoming glass mass. The temperature of the space between the rolls and the flow spout can be controlled with more accuracy; the effect thereof being a better equalization of the temperature of the glass mass 7. This equalization of temperature is of great importance because the equality of the temperature of this glass mass is constantly disturbed by contact with the pouring plate 2, the rolls, the lateral collars 20, and the outside air, all of which impairs the fitness of the glass for the rolling and the evenness of the sheet. The temperature is controlled by the heating gas outlets 8 and 10 which are equipped with regulators. By means of the nozzles 9 and 10 further heat can be supplied and cooling air or a mixture of air and steam brought in. A further important means of regulating this temperature and equalizing the temperatures in the glass heap 7 is that the top roll 6 can be swung around the axis of the lower roll 5. By this the glass heap 7 can be enlarged or reduced.

The patent specification points out that in spite of all

* Of Dessau, Germany. This work is appearing in German in the new edition of *Dralle-Keppeler*, "Die Glasfabrikation."

FOOTNOTE: In the Figures, originally prepared for use eventually in the new edition in the German language of *Dralle-Keppeler*, "Die Glasfabrikation" in 1931, dimensions are given in metres (*m*) and millimetres (*mm*). We would like to have given these in feet and inches but the translation and the making of nearly two hundred and fifty new illustrations would have involved a prohibitive loss of time and expense. To some of our readers the metric system is as familiar as the English units; for the others we may say that a metre is approximately 40 inches, and a millimetre is approximately 1/25 of an inch. A thousand millimetres, of course, go to a metre.—F. W. P.

these means of regulation one cannot avoid the upper layers of the glass heap 7, nearer to the outside air and to the top roll 6, retaining more heat than the lower layers which are nearer to roll 5. This is why the upper layers of the sheet forming itself between the two rolls stay soft for a longer time than the lower ones. The innermost layer of the sheet

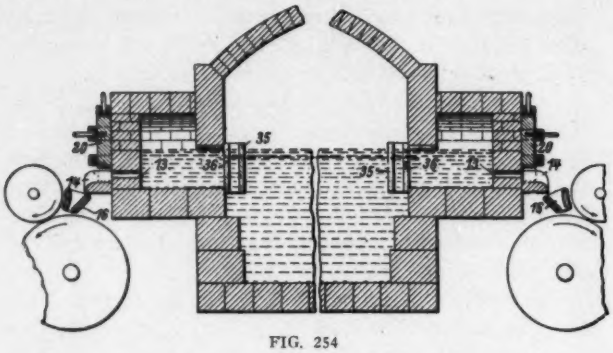


FIG. 254

is the hottest and still so fluid that it may flow faster than the forward pass of the whole glass ribbon, so exerting a pressure on the outer parts. If the top layers are so soft that they cannot resist this pressure at all points, especially when they are reheated again and again from the core of

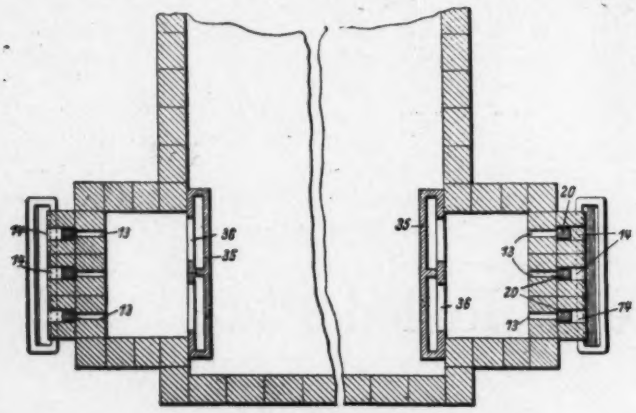


FIG. 255

the sheet, bumps, waves, and wrinkles may show up. Therefore the revolving speed of the top roll 6 should be controllable independently of that of the lower roll 5 and kept slower by about 8%. This is done to obtain an especially even and smooth surface of the sheet and is stated to be much better than the arrangement of two flattening rolls behind the original rolling machine for instance.

The slide-gate 19 above the ridge 3 of the plate 2 serves in case an interruption of the glass stream might become necessary.

According to U. S. patents 1531089 and 1532134 of Frederick Gelstharp, assignor to the Pittsburgh Plate Glass Company (Figs. 259 and 260), the flow spout 4 lies again below—the level of the mass of molten glass in the tank, and, by an arrangement not illustrated here, even in the floor of the forehearth 2. The glass does not flow out in form of a narrow, thick stream but in form of a broad stream which is relatively thick in comparison with the thickness of the ribbon to be rolled. The width of this stream is almost the same as the width of the finished sheet. The most significant feature of the invention is the arrangement of the rolls 5 and 6 which are fitted close to the wall of the furnace so that the space between the two rolls regulates the flow of the glass. Two interchangeable outlet members 40

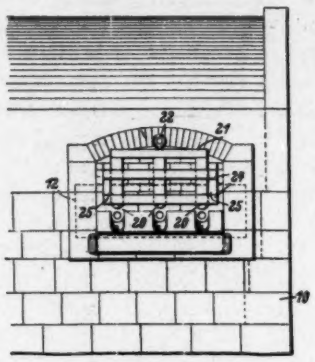


FIG. 256

made of heat resisting material and capable of being heated extend in between the rolls and prevent the glass flowing laterally down the rolling machinery. This construction is said to have the advantage that the glass reaches the rolls without being disturbed and chilled, and without coming in contact with the outside air or having a chance to pick up foreign matter.

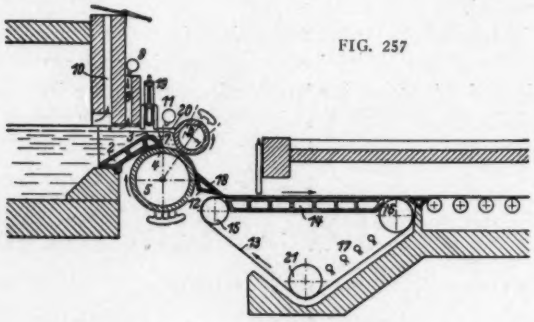


FIG. 257

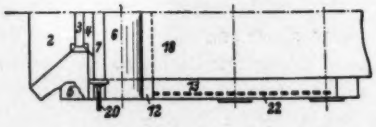


FIG. 258

If the flow of the glass should be interrupted, the two rolls 5 and 6 are driven backwards. In order to prevent the glass in the outlet growing stiff (which would delay the resuming of the rolling) electric windings 7 made of nickel chromium with leads 8 are installed. For a longer stop, the glass is permitted to grow stiff at 4 and, if the rolling is taken up again, is remelted by means of this electric heating device.

U. S. patent 1560078 of the same inventor describes the wall 3 of the tank carrying the spout 4 (Fig. 261) as vertically adjustable in order to give the spout 4 the right position with respect to the space between the rolls.

Fig. 259 shows how the front wall of the furnace is fitted

to the rolls 5 and 6 ending towards the rolls above and below the spout 4 in acute projections. Fig. 261 shows the air or water cooled lips 22 and 23 which are made of heat resisting metal and conduct the glass in between the

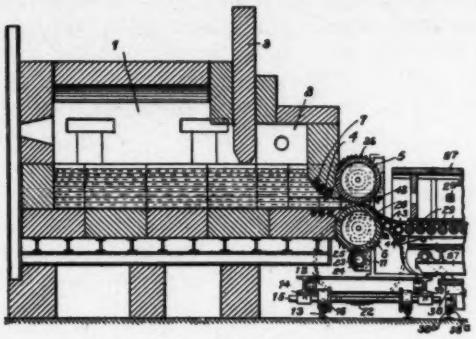


FIG. 259

rolls. The inventor claims that these cooled lips eliminate bubbles. However, they do also chill the glass and thereby offset the advantages mentioned earlier, but if the lips were allowed to become too hot, the glass would stick to them.

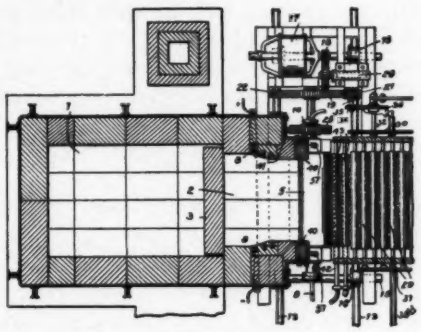


FIG. 260

Without the lips the glass would clog before the rolls and the area of contact between glass and rolls would be very large; the glass would chill still more and even might grow stiff without special heating arrangements.

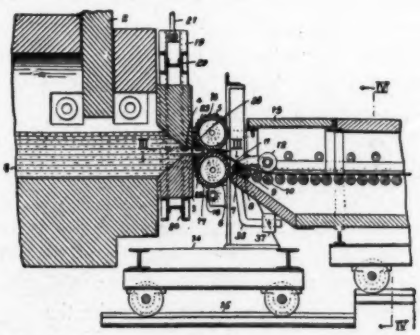


FIG. 261

U. S. patent specification 1628353 of Louis Boudin, assignor to S. A. des Manufactures des Glaces & Produits Chimiques de Saint Gobain, Chauny et Cirey, of Paris, France, (Fig. 262) shows therefore the "pass" g between the rolls placed on a higher level than the outlet a, omitting any kind of lips or bridges. The glass coming out of a is at once carried along by the lower roll c and contacts with the top roll d only at the pass between the two rolls. By these arrangements the chilling of the glass should not exceed the suitable limits.

This same patent specification also describes a way of locating the rolling machinery at such a distance from the outer end of the outlet that a greater amount of glass a can be accumulated (Fig. 263). The outlet f of the tank is located below the level k of the glass and the pass between the rolls lies on the same level as the outlet f. On account of the tension of its surface the glass heap a will not rise as high as the level k of the glass mass in the tank; of

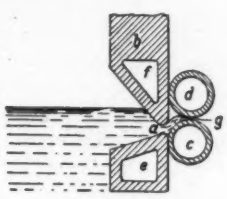


FIG. 262

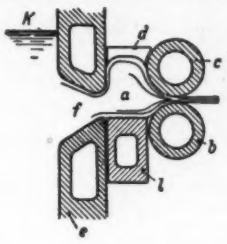


FIG. 263

course, its height is also determined by the size of the outlet f and of the space between the rolls as well as by the revolving speed of the rolls. Quite contrary to the arrangements shown in Fig. 262, both the rolls b and c are in contact with the glass to a great extent. So, if too much chilling of the glass heap is to be avoided, it must be reheated, or the glass must come out of the outlet f so hot and the rolls must revolve so fast that the chilling does not exceed the admissible limits. However, the disadvantage of too hot glass has been pointed out before and the rolls cannot be driven beyond a certain speed if they are to produce a continuous glass ribbon, as then the lehr would have to be built too long. As shown by Fig. 263, the lateral wall blocks d and the bottom block l can be heated. This heating will protect the glass heap a from too much chilling, but it will scarcely suffice to perform the effective and thorough heating desirable for such a heap before it is formed between the rolls.

(To be continued)

Colors as Insect Deterrents

As bearing on the apparent aversion of house flies to certain colors of light, and the possibility of keeping them out of buildings with colored glasses, we reprint below a note that appeared recently in *The* (London) *Times*.

INSECTS AND COLOR

Mr. R. J. Wilkinson-Sands quotes a discovery by Mr. Alexander Duckham, made "some years ago," that a certain shade of blue was avoided by insects. Between 1900 and 1905 (when I left South Africa) we took to using either pink or yellow net for our mosquito curtains, as no insect was ever found in the folds, whereas they frequently were in those of white net. This was due to an experiment with four fig boxes lined respectively with pink, navy blue, yellow, and grey flannel. The blue and grey ones were thickly covered with mosquitoes, while there were only two or three found in either the yellow or the pink. I have also seen a nurse's blue veil on her bonnet hanging on the back of a door very thickly covered with mosquitoes.—MRS. C. M. SHERIFF, 2, Milborne-grove, S.W.10.

[Letters on this subject under the title "The Glass Man and the House Fly" appeared in THE GLASS INDUSTRY, p. 203, September 1930.]

Glass Industry

ESTABLISHED 1920

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Removal Notice

The office of THE GLASS INDUSTRY has been moved to the Rhinelander Building, 2 Duane Street, New York, occupied almost exclusively by printers and publishers.

Responsibility of the Glass Manufacturer for Accidents to Users of His Products

QUITE recently two significant court decisions were recorded relating to the liability of glass manufacturers for damages resulting from personal injuries alleged to have been caused, in one instance, by the "explosion" of a glass bottle, and in the other by a broken windshield. Both decisions put the responsibility on the manufacturers, neither of whom had made any warranty either expressed or implied as to the character of their products directly to the buyers, and no privity of contract existed between manufacturers and buyers. In the written opinion of the Court in the latter case it was pointed out that since the rule of caveat emptor—"let the buyer beware"—was first formulated, vast changes have taken place in the economic structures of the English-speaking peoples. Radio, bill boards and printed advertising have become tremendous factors in creating the demand that causes the flow of products from factories to the ultimate consumer. It would be unjust under these conditions to deny the buyer the right to cover if damage results from the absence of those qualities he was led to believe the product possessed, when such absence is not noticeable to the buyer at the time of the purchase.

The growing tendency to hold the manufacturer responsible to the ultimate purchaser is shown by frequent exceptions from the generally accepted, long-standing rule that a manufacturer is not liable to any other person than his immediate vendee.

These exceptions, including the recent decisions cited above, seem to indicate that the courts will continue to rule likewise in cases where the negligence of an employe in the manufacture of a product or other causes results in damage to the buyer, even though it is recognized as impossible for a manufacturer, especially one maintaining a large organization, to absolutely prevent isolated instances of carelessness or negligence by his workers in their manufacturing, testing and inspecting operations.

Though the chances of accident can be almost completely eliminated by the continuous exercise of extreme caution on the part of all employes, as long as human fallibility remains a factor in production processes, no manufacturer can feel absolutely sure that he will not some day become the victim of some such unfortunate occurrence.

The case of the bottle accident was on an appeal from a lower court verdict for $37,500 damages against both the maker of the bottle and a soda water bottler. The Court of Appeals sustained the verdict against the bottle maker but released the bottler from responsibility. The bottle maker had made the customary polariscope tests to check up on the annealing of the glass but failed to make the hot and cold water test. All the other tests it is said, commonly used, had been made. In this decision the Court applied and expanded the principles involved in the McPherson case in 1916 by Judge Cardozo, in which a manufacturer was found liable to a third party with whom he had no contractual relations.

Reference to the contents of earlier issues of THE GLASS INDUSTRY can be found in THE INDUSTRIAL ARTS INDEX in many Public and Technical Libraries.

Rights of Employers to Employes' Patents

A Question of Vital Importance to Many Manufacturers

A COURT decision of interest to users of belt conveyors such as glass manufacturers was handed down at Boston, Massachusetts, by District Judge Brewer. This case, reported recently in the *United States Daily*, once more illustrates the importance both to manufacturers who are employing men on work connected with the development of new inventions and to the employe so occupied, of having a definite and complete understanding before beginning any development work as to the ownership of any patents which eventually may be obtained in the name of, or by, the employe.

By a bill in equity, the complainants as receivers of the Wickwire Spencer Steel Company, seeked to compel the assignment by the respondent, Francis N. Woodman, of patents and applications for letters patent covering conveyor belts and improvements thereon. The respondent Woodman entered the employ of the Wickwire-Spencer Steel Company in 1924, his first work being in the nature of that of a cost accountant. Later he was appointed assistant superintendent at the company's Clinton, Massachusetts factory and was instrumental in organizing their engineering department. About 1924 the Wickwire company began manufacturing in that plant a conveyor known as a "spiral belt". By October, 1928, a so-called "high temperature belt" was constructed of material that could be subjected to extremely high temperatures. This belt was exhibited in 1928 at Philadelphia at the meeting of American Society for Steel Treating. Meantime, Mr. Woodman was giving his attention to the overcoming of objections to spiral belts and in perfecting these devices. A report on this exhibition addressed to Mr. Woodman's superior officer in the company Mr. Macklin, and to Mr. Woodman stated that Mr. Woodman had advised that the flat belt be studied for any special features that could be discovered which would render it available for the company's use and that it be covered by patents. Nothing was done, however, towards bringing out flat belts until the summer of 1929, when Mr. Woodman turned his attention to the problem and had a drawing prepared by a company employe which was made outside of working hours and paid for by Mr. Woodman. The model of the belt, however, was made by the Clinton plant by employes of the complainants, during working hours and the machinery, tools and materials used were those of the complainant, and experiments and tests were made by the respondent's fellow employes and apparently from suggestions of those of the engineering department adopted by the respondent. From this time until June 1931, when the respondent severed his connection with the receivers, other flat link belts were developed by him at the Clinton plant in much the same way. A number of different types of belts in which the hinges used as a means of holding together the links or the flat plates were developed, patents for which were issued to the respondent or by application by letters patent filed by him, upon which patents have not yet been issued and it is these patents and application for letters patents that the complainants claimed should be assigned to them.

It was not until 1928 that the respondent began to reveal his inventive genius but from that time and until he severed his connection with the work he gave an ever increasing amount of attention to experiment and research carried on under his supervision and as the results crystallized, the new products too were protected by applications for letters patent, many of which were filed in the name of the respondent, Woodman.

In January, 1929, Mr. Macklin advised the respondent that thereafter no application for letters patent should be filed at the company's expense without first getting authority from the officials in charge of legal matters. The respondent assented to this restriction. After he had developed his first flat link belt he took up directly with his attorneys the matters of securing a patent thereon. In September, 1929, he showed Mr. Macklin a model of the belt and he told him then that he was taking out the patent on his own name and at his own expense. Up to this time the respondent had filed eleven applications, all of which he had assigned to the complainants. The respondent has given as reasons for departing from the practice that had heretofore been carried out, of taking out patents at the expense of the company, that this invention involved an entirely new principle in metal conveyors and marked a distinct advance in the art and that the plant being operated under receivership might at any time be sold and passed into other hands.

In June, 1931, another request for assignment of the patents and application was made to Mr. Woodman but was refused and the respondent resigned from his connection with the company on June 13, 1931. Subsequently four patents were issued, two covering the flat link belt and two covering the plate belt. In addition to these patents, applications for others are pending covering inventions and improvements in link belts and flat plate belts.

Judge Brewer points out that prior to January 1, 1932, there was only one increase in the respondent's salary and there is no evidence warranting the inference that this increase was in payment or recognition of the respondent's inventive genius. Woodman's duties as superintendent included the exercise of due diligence and skill in promoting the success of the business carried on by complainants. It does not appear, however, that at any time Woodman expressly agreed to devote his skill or energy in the invention of new products. The complainants invoked the powers of the court not only to establish full ownership in the patents already issued but also in pending applications for other patents and applications covering inventions conceived and developed by the respondent while in the employ of the complainants.

The decision goes on to quote the cases of Dalzell v. Dueber Watch Case Manufacturing Company, also Hapgood v. Hewitt, Ingle v. Landis Tool Company, Pressed Steel Car Company v. Hansen, Johnson Furnace and Engineering Company v. Western Furnace Company, Amdyco Corp. v. Urquart, Manton-Gaulin Manufacturing Company, Inc. Other references relating to the relationship of employer and employe, the nature of the employment and the development of the invention during hours of employment and at the employer's expense were quoted. In this case it is conceded that there was no written or oral agreement between the respondent and the complainants. "While the fact that respondent had assigned other patents or inventions is some evidence of the existence of an agreement to assign all inventions, it is not conclusive."

The judge's opinion includes the following:

At the outset we are met with the general proposition, firmly established, that "a manufacturing corporation, which has employed a skilled workman, for a stated compensation, to take charge of its works, and to devote his time and services to devising and making improvements in articles there manufactured, is not entitled to a conveyance of patents obtained for inventions made by him while so employed, in the absence of express agreement to that effect." Dalzell v. Dueber Watch Case Mfg. Co., 149 U. S. 315, 320. See also Hapgood v. Hewitt, 119 U. S. 226. Ingle v. Landis Tool Co., 272 F. 464.

The relationship of employer and employe, the nature of the employment and the development of the invention during hours of employment, and at the employers expense, are circumstances which have universally been held sufficient to confer upon the employer an irrevocable license to use the invention without payment of any royalty, especially when he has tacitly and expressly consented to such use. Solomons v. United States, 137 U. S. 342; McAleer, Admx. v. United States, 150 U. S. 424; Lane & B. Co. v. Locke, 150 U. S. 193; Keyes v. The Eureka Consolidated Mining Co., 158 U. S. 150; Gill v. United States, 160 U. S. 426; Houghton v. United States, 23 F. (2d) 386.

Whatever effect may be given the course of conduct pursued by the respondent relative to the assignment of patents prior to September, 1929, it is obvious that subsequent to his conversation with the general manager he did intend to assign the patents or applications involved in this suit. On the contrary, the evidence negatives such an intention. If the complainants understood that the patents would be assigned, this understanding entirely lacked mutuality.

The fact that the respondent did not follow the course laid down by his superiors and present his applications for approval before submitting them to the patent attorneys; his statement to the general manager that he was taking out the patents in his own name and at his own expense; and the fact that he paid all expenses after being advised that he need not do so; all are inconsistent with the existence of any intention on the part of the respondent to part with the absolute title to the invention.

The complainants nevertheless press upon the court the argument that, even in the absence of an express agreement to assign the

patents, they became the property of the complainants (a) by reason of the nature of the employment and the ends sought for in employing the respondent, and (b) that the respondent was assigned specifically the duty of developing the belts, which were the subject matter of the patents and application for Letters Patent in suit. In support of their contention, the complainants cite Solomons v. United States, supra; Gill v. United States, supra; Standard Parts Company v. Peck, 264 U. S. 52; Houghton v. United States, supra; Wireless Specialty Apparatus Co. v. Mica Condenser Co., Ltd., 239 Mass. 158.

It is significant that the learned judge, early in his opinion, acknowledged the ownership of the patent to be in the assignee of the patentee, and when he is dealing with the exception to the general rule, he says only that the employe cannot under the circumstances recited, *plead title against his employer.* (Italics mine.) The court was dealing only with the rights of the employer to use the invention, and I am not persuaded that the court intended to modify the doctrine laid down in the Hewitt case. The doctrine has since been reaffirmed in the Dalzell case.

The facts of the case at bar do not come within the Peck case. The respondent was not originally employed because of his technical skill. When he entered the employ of the Wickwire Spencer Steel Company, it was not known that he possessed any aptitude as an inventor. He was promoted to the position of superintendent, and he assumed the duties of generally supervising the operations of a manufacturing plant.

Quite naturally, it was his duty, among others, to see that the products of the plant kept pace with the demands of the trade, that research and experiments were conducted with a view to discovering and developing improvements upon the product. If, in the performance of these duties, he developed a talent for working out novel and useful devices, it does not follow that he was employed to invent any specific device.

* * *

If he had never invented anything, he could not have been charged with a failure in the performance of his duties as superintendent or with the failure to fully earn his compensation. Not only is there no contract to assign his inventions, but there is, in this case, no contract to invent. In the absence of either of such contracts, the great weight of authority is to the effect that the employer has an irrevocable license to use the invention but has no rights to compel a conveyance of the patent covering the invention.

The first link belt developed at the Clinton plant was Woodman's conception, and it must be assumed that he was the first inventor of all the patented devices. Whether others are the real inventors of any of the link, or plate, belts for which applications were filed by Woodman, is a question that must be determined in other proceedings.

My consideration of the cases leads me to the opinion that the doctrine of Hapgood v. Hewitt, supra, and Dalzell v. Dueber Watch Case Mfg. Co., supra, has not been modified by subsequent decisions. On the contrary, the doctrine seems to have been adopted in the majority of cases arising in the lower courts. I hold the doctrine to be applicable to the case at bar and that, therefore, the relief prayed for in the instant case must be denied.

The bill may be dismissed.

Recent Patents

NEW INVENTIONS DESIGNED TO IMPROVE GLASS AND THE MEANS OF PRODUCING IT

Complete copies of U. S. Patent Specifications may be obtained from the Commissioner of Patents, Washington, D. C., Price 10c each

COLORLESS GLASS. U. S. 1,868,065. July 19, 1932. Georg Jaeckel, Berlin-Lichterfelde, Germany, assignor to Firm Sendlinger Optische Glaswerke G. m. b. H., Berlin-Zehlendorf, Germany. Filed 11/20/30 and in Germany 11/22/29.

METHOD OF MAKING HOSIERY AND PRODUCT THEREOF. U. S. 1,869,304. July 26, 1932. John C. Decker, Abington and Harry Aull, Philadelphia, Pa., assignors to Friedberger-Aaron Manufacturing Company, Philadelphia, Pa. Filed 3/10/32.

PROCESS FOR THE HOMOGENIZATION OF GLASS FLUX. U. S. 1,868,858. July 26, 1932. Rudolf Thum, Unterreichenau, Czechoslovakia, assignor to the Firm Montan-und Industrialwerke, volmals Joh. Dav. Starck, Prague, Czechoslovakia. Filed 12/6/29 and in Czechoslovakia 12/7/28.

PROCESS AND APPARATUS FOR THE MANUFACTURE AND LEERING OF GLASS SHEETS. U. S. 1,869,297. July 26, 1932. Max Bicheroux, Aachen, Germany, assignor to The American Bicheroux Company. Filed 8/6/28 and in Germany 4/7/28.

GLASS CUTTING MECHANISM. U. S. 1,869,044. John A. Boush, Vincennes, Ind., assignor to Blackford Window Glass Company, Vincennes, Ind. Filed 1/21/28.

HANDLING GLASS ARTICLES. U. S. 1,868,480. July 26, 1932. James Bailey, Corning, N. Y., assignor to Corning Glass Works, Corning, N. Y. Filed 5/1/29.

GLASS ANNEALING LEER. U. S. 1,865,891. July 5, 1932. John L. Drake, Toledo, O., assignor to Libbey-Owens-Ford Glass Co., Toledo, O. Filed 12/3/30.

SAFETY GLASS. U. S. 1,864,983. June 28, 1932. William Charles Davis, London, England. Filed 4/10/29.

GLASS DRAWING APPARATUS. U. S. 1,864,930. June 28, 1932. Lonnie J. Pierce and Frederic L. Bishop, Pittsburgh, Pa., assignors to American Window Glass Company, Pittsburgh, Pa. Filed 7/26/30.

GLASS FORMING MACHINE. U. S. 1,864,689. June 28, 1932. Ira H. Freese and Haller H. Dawson, Clarksburg, W. Va., assignors to Hazel-Atlas Glass Co., Wheeling, W. Va. Filed 3/25/26.

METHOD OF GETTING AND DELIVERING FORMED CHARGES OF VISCOUS GLASS. U. S. 1,864,279. June 21, 1932. Oliver M. Tucker and William A. Reeves, Columbus, O., assignors to Hartford-Empire Company, Hartford, Conn. Original application filed 11/1/18. Divided and this application filed 11/26/24.

GLASSWARE ANNEALING LEHR. U. S. 1,863,687. June 21, 1932. Albert N. Cramer, Toledo, O., assignor to Owens-Illinois Glass Co., Toledo, O. Filed 5/28/28.

LAMINATED GLASS AND PROCESS OF PRODUCING THE SAME. U. S. 1,867,787. July 19, 1932. George B. Watkins, Toledo, O., assignor to Libbey-Owens-Ford Glass Company, Toledo, O., Filed 4/12/29.

APPARATUS AND METHOD OF MANUFACTURING SHEET GLASS. U. S. 1,867,940. July 19, 1932. Lucien Delloye, Paris, France, assignor to Societe Anonyme des manufactures des Glaces & Produits Chimiques de Saint-Gobain Chauny & Cirey, Paris, France. Filed 12/13/28 and in France. Filed 12/13/27.

GLASS BUILDING-STONE, TILE OR LIKE BUILDING ELEMENT. U. S. 1,868,236. July 19, 1932. Jetze Williem Janzen, The Hague, Netherlands, assignor to Naamlooze Vennootschap: Glasfabriek "Leerdam," Voorheem Jeckel, Mijnssen & Co., Leerdam, The Netherlands. Filed 10/24/29.

SHEET GLASS GRINDING AND POLISHING APPARATUS. U. S. 18,533. July 19, 1932. John L. Drake and Frank Fraser, Toledo, O. Assignors to Libby-Owens-Ford Glass Co., Toledo, O. Filed 9/29/26.

METHOD OF MANUFACTURING WIRED GLASS. U. S. 1,868,177. July 19, 1932. Fred H. Rowe, Gloucester, Mass., assignor to The Clear View Wind Shield Company, Boston, Mass. Filed 12/20/28.

SHEET GLASS ROLLING MACHINE. U. S. 1,868,274. July 19, 1932. Carroll Cone, Toledo, O., assignor to Libbey-Owens-Ford Glass Co., Toledo, O. Filed 11/7/30.

GLASS SURFACING MACHINE. U. S. 1,868,275. July 19, 1932. Joseph P. Crowley, Toledo, O., assignor to Libbey-Owens-Ford Glass Company, Toledo, O. Filed 8-28-25.

PROCESS AND APPARATUS FOR THE MANUFACTURE OF GLASS. U. S. 1,865,820. July 5, 1932. James C. Blair, Toledo, O., assignor to Libbey-Owens-Ford Glass Company, Toledo, O. Filed 12/5/29.

PROCESS AND APPARATUS FOR PRODUCING SHEET GLASS. U. S. 1,865,826. July 5, 1932. Carroll Cone, Toledo, O., assignor to Libbey-Owens-Ford Glass Company, Toledo, O. Filed 6/11/30.

PROCESS AND APPARATUS FOR PRODUCING SHEET GLASS. U. S. 1,865,843. July 5, 1932. John L. Drake, Toledo, O., assignor to Libbey-Owens-Ford Glass Company, Toledo, O. Filed 10/29/27.

PROCESS AND APPARATUS FOR SHEET GLASS MANUFACTURE. U. S. 1,865,890. July 5, 1932. John L. Drake, Toledo, O., assignor to Libbey-Owens-Ford Glass Company, Toledo, O. Filed 12/20/29.

Possibilities for Bottle Factory in British Columbia

Opportunities for development of a bottle and glassware industry in British Columbia to satisfy annual requirements said to reach $700,000 on a conservative basis, is pointed to in the latest bulletin issued by the Department of Mines, as a result of the province-wide non-metallic resources survey being conducted by A. M. Richmond, an engineer in the employ of the province.

The bulletin was released for publication by Hon. W. A. McKenzie as the third of a series of valuable reports on non-metallic deposits.

"From the results of a recently completed survey among the bottle and glassware consumers of the province, principally located at or near Victoria, Vancouver, and New Westminster, it is conservatively estimated that approximately 17,500,000 new bottles with a delivered value of $685,290 are purchased annually by distilleries, wineries, soft drink manufacturers, canning and preserving factories, pickle and vinegar works and various smaller users."

Mr. Richmond goes on to show the high wastage in the trade and the need for renewal of purchases of glassware through breakages, export and otherwise.

A stiff tariff against imported glassware affords considerable protection in the home field, while freights to some extent give opportunity for British Columbia manufacture against imports from other provinces.

At present most of the bottles are brought in from the Dominion Glass Company factory at Redcliffe, Alberta, there being no glass manufacture in the province of British Columbia.

During 1931, the report continues, distilleries in the province used glassware with a delivered value of $397,900, canners $98,000, brewers $92,000, dairies $40,490, druggists $34,500, soft drink makers $7,800, and miscellaneous users $15,000 worth. This accounts only for new bottles and does not take into account sums paid for reclaimed bottles after their initial use.

It is not only glass that enters into the question, for an analysis of the costs of one Canadian plant recently showed 21.5 per cent of the cost of manufacture paid out for crates and containers for the finished glassware. In this connection British Columbia would have a decided natural advantage in abundant wood supplies.

The raw materials include sand, limestone, soda ash, salt cake, carbon, borax, arsenious oxide, selenium and manganese dioxide in varying quantities depending on the type of bottle.

The value of pressed and blown glass made in Canada in 1929 was $11,197,382, lumber to the value of $767,307 went into the crating and packing containers, and miscellaneous supplies worth $876,521.

In that year 97,298 tons of silica sand were utilized.

British Columbia has reserves of silica sand, lime and other necessary ingredients for the manufacture of glassware.

The survey does not mention whether it would be feasible to develop an export trade in bottles from a location on the Canadian Pacific Coast.

Dodge Construction Reports

New construction contracts awarded in the thirty-seven states east of the Rocky Mountains during the period from August 1 through August 15 totaled $55,378,500 according to F. W. Dodge Corporation. This contrasts with $116,553,100 for the corresponding half-month of 1931. During all of July a total of $128,768,700 was reported for the thirty-seven states which compared with $113,075,000 for the entire month of June and $285,997,300 for July, 1931. The advance over the previous month's contract total was produced by larger awards for non-residential building and public works; residential contracts and awards for public utilities showed declines from their respective June totals.

Corrections

In the article by Roy E. Swain, "A Study of Pulsating Feeders for Molten Glass," which continued through the June, July and August, 1932, issues, there appeared two typographical errors, to which we desire to call our readers' attention. The first, on page 101, June issue, gave the number of a Davidson and Schram patent as 1,388,214, which should have been 1,338,214. In the August instalment on page 135, a Wm. J. Miller patent was referred to as No. 1,651,636 while the correct number is 1,651,036.

C. A. Borchert Decorating Company is completing its new plant at East Weston, W. Va., which has been built on the original site of the plant destroyed by fire earlier in the year.

New Method of Lining Melting Pots

A new material developed to protect the surface of glass melting pots, tank blocks and other clay products coming in contact with molten glass from the ravages of the batch chemical reactions is being offered to the trade in this country in small quantities permitting actual experiments and tests of its efficiency at a slight cost. This material has been in practical use in Germany for some time, over 3400 pounds having been sold to glass plants during a 4-months' period in Germany and Czchoslovakia, and its efficiency in prolonging the life of glass house refractories, where they contact with the molten glass has been attested to by a well-known glass manufacturer of that country, R. Greiner & Co., G. m. b. H., Riestchen Oberlausitz, Silesia, Germany. An article in a leading German glass trade publication pointed out that it is being used on melting furnace crowns and ports and for several other purposes, and comparisons made of the treated sections with the untreated parts are claimed to show pronounced superiority of the former. Melting pots operated over a period of 13 weeks showed no corrosion nor pitting while clear glass of excellent quality was being produced.

Crowns and pots used for melting opal glass which were lined with the new material are said to have been found in such good condition when a test was concluded that they were continued in operation, the walls and rims of the openings remaining smooth and even. It is further stated that a feature discovered in connection with the use of this pot and tank lining material is that it makes the removal of glass deposits formed on the refractories during operation an easy matter. A slight tap causes them to fall off, indicating that the layer of "Re-Lin-Us," which is the trade name adopted, forms a coating not easily penetrated by the fused batch materials. It is stated by those interested in developing this material that the discovery of the protective properties of the material was made accidentally in connection with glass wool manufacturing operations on a small scale and that research on furnaces of normal dimensions demonstrated its applicability to any size.

Re-Lin-Us, in its liquid form, is applied to the pots simply by brushing on a thin layer after they have been thoroughly dried in the kiln, and in the case of other refractories it is applied shortly before using.

Compromise Reached on Wage Reductions

At the annual conference of the National Association of Manufacturers of Pressed and Blown Glassware and the American Flint Glass Workers Union at Atlantic City late in July agreements were effected for a substantial reduction in the wage schedule, which will be submitted by a referendum to approximately 7,000 glass factory employes. If finally accepted the following reductions will become effective early in September: Press ware, 17½ per cent; machine press, 12½ per cent; punch tumbler and stemware, 17½ per cent; paste and iron mold table and bar ware, 15 per cent; general caster place, 10 per cent; chemical division, 12½ per cent; other divisions referred back for individual settlement at the plants. No change was made in the chimney department, which accepted a reduction of 20 per cent over a year ago. The cutting department agreed upon 10 per cent reduction and mold making department 15 per cent. The engraving scale will be settled at a special meeting to be held in Pittsburgh.

The Glass Bottle Blowers Association of United States and Canada, also meeting at Atlantic City, agreed with the bottle manufacturers that reductions in wages of 16⅔ per cent will be made in the automatic machine department, and in the hand blown and stopper grinder departments of 10 per cent. This follows a reduction in wages agreed upon at Baltimore early in 1932 when the previous year's agreement was renewed.

Sands, Clays and Minerals. A new magazine devoted to economic materials, published by Algernon Lewin Curtis, P. O. Box 61, Chatteris, England, issued quarterly at 5 shillings per annum. Volume I, Number 1, published in April, 1932, contains 40 pages of matter on subjects covered by the title of the magazine.

The First Bohemian Glass Works, recently reported through Alfred O. Corbin, director, that gross profits for the year 1931 of $527,000, and net profit, $74,000, had been earned. Capital has been increased to 25,000 Czech crowns. A dividend of 6 per cent will be paid on the increased capitalization.

Owens-Illinois Midsummer Statement

Owens-Illinois Glass Company statement for the twelve months ended June 30, 1932, shows gross manufacturing profit after deducting material used, labor, royalties, repairs and manufacturing expenses, less depreciation, a net manufacturing profit of $4,573,753 and adding royalties from the Company's own factories, licensed, and other factories amounting to $1,881,842 giving a total manufacturing profit and royalties of $6,455,596. Interest received amounted to $146,088, discounts and commissions $112,368, dividends, rents and miscellaneous income amounted to $287,431. Deducting a loss on operation of gas properties, $22,890, leaves a balance of $264,540, and gross income of $6,720,137. Expenses and losses including selling, administrative patent and royalty expenses, development and general expenses $3,678,834, interest paid on debentures and premium paid on debentures purchased $189,975, discounts on sales and provision for bad debts $419,037, write-down of U. S. government securities and Federal Land Bank bonds to market value at December 31, 1931, $159,708; provision for possible loss on cash in closed banks $180,060, loss on sale or other disposal of assets and other sundry expenses $15,641, total $4,643,258. Net income before providing for income taxes $2,076,878, provision for income taxes (estimated) $246,650, net income for twelve months $1,830,228. Dividends on preferred shares $480,000, net available for common shares $1,350,228. Common shares outstanding 922,173. Earnings per share on common stock $1.46.

President Wm. E. Levis, in his report to stockholders dated June 30, 1932, showed the company's current assets as $17,856,376, current liabilities $1,718,756, leaving a net working capital of $16,138,619, a gain over the December, 1931, report of $1,584,050. The volume of the business in the glass container industry of the United States for the first half of 1932 was only 23% less than in the first six months of 1929 which was the peak period. The company's decline in volume was in approximately the same proportion. New uses for glass are being diligently sought by the company, in order to offset the condition of over-capacity in production facilities, and progress has been made along this line.

Dr. Cohn's New Consulting and Research Service

Dr. Willi M. Cohn of Cambridge, Mass., who has been conducting fundamental research work for the Owens-Illinois Glass Company, is, we understand, planning to devote his service in the future to independent work as a consulting and research physicist, applying the methods and results of modern physics to the many problems of the glass industry. He may be reached at 168 Lexington Avenue, Cambridge, Mass.

Swedish Cooperative Union Making Glass Bulbs

A factory set up in opposition to an international trust or "cartel" which controlled the market in a number of countries has been put into operation near Stockholm, Sweden. Since the beginning of production the price has fallen from 1.35 kroner to .85 kroner, the latter being the price of the cooperative lamp. The drop in prices has amounted to 37%.

Tariff Commission to Investigate Fluorspar

On August 16 a public hearing in regard to the differences in cost of production of fluorspar will be held on a date for which notice will be given by the Commission later.

The Midwest Glass Company, 2235 Buck Street, Columbus, O., was reorganized by a syndicate consisting of Harry Ritter, A. J. Suhre and A. L. Merkel. Application for a charter was made at Columbus, by J. R. Clark. The company will manufacture mirrors, automobile accessories and other glass products.

Toledo Engineering Company, Inc., 983 Front Street, Toledo, O., glass plant engineers. A twelve page pamphlet describing the company's service, method of operation, principles of furnace design, etc.

George Drabbe, Pacific Coast agent for the Union Commerciale Des Glaceries Belges, Brussels, Belgium, has moved from 562 Fifteenth Avenue to 1730 Twenty-fourth Avenue, San Francisco, Cal.

Consolidated Products Company, dealers in used machinery and equipment have moved their office to Rooms 2008-14 Park Row, New York.

New Marietta Manufacturing Corporation

The Marietta Manufacturing Company, Indianapolis, Ind., which has been in receivership, has been purchased by a new corporation styled Marietta Manufacturing Corporation, organized under the laws of Indiana. All assets were included in the transaction, and ample working capital has been provided for the continuance of the company as a going concern.

The officers are Sylvester Johnson, Jr., president and treasurer; M. G. Johnson, vice-president, and F. R. Weaver, secretary. Associated in the venture are a number of Indianapolis business men of large experience as well as many of those identified with the predecessor company.

Operations in the finishing end have been continuing as heretofore, and glass is now being produced to meet the necessary requirements. The company will continue to manufacture a full line of wainscoting, cabinet tops, counter tops, table tops, shelving, etc., under the registered trade name Sani-Rox. The distribution policy established by its predecessor company will be followed by the reorganized company.

Corning Glass Works Using More Natural Gas

The use of natural gas supplied by a pipe line of the North Penn Gas Company to the Wellsboro plant of the Corning Glass Works will increase the company's consumption of this type of fuel, as it will replace producer gas hertofore used in the big tank which supplies glass to the famous automatic machine developed by the Corning staff. This machine has a production capacity several times that of the best types of machines previously in use and multiplies the daily production of bulbs to an almost unbelievable figure in the hundreds of thousands.

Safety Glass Needed in Passenger Cars

A new argument in favor of compelling steam railroads to equip their passenger cars with safety glass is found in an accident which occurred on August 1 to a passenger on an excursion train traveling from Boston to New York, when an indicator plug on a locomotive traveling on the adjoining track in the opposite direction, blew out, releasing steam under high pressure which broke forty windows. The flying glass injured many persons, one seriously and others with minor cuts and burns.

The Corning Glass Works recently announced the purchase of the tubing, industrial and railway glassware business of the Libbey Glass Manufacturing Company of Toledo, Ohio, and these products will hereafter be manufactured at the Corning plant. The Libbey Company will continue the manufacture of tumblers which has been its specialty for many years.

Schohy Sheet Glass Company's plant at Sisterville, W. Va., which closed down recently after a long and successful run will, it is reported, resume operations as soon as improvement and additions to the equipment are completed.

The Triplex Safety Glass Company, of London, England, recently declared a dividend of 10% less tax on the common stock of the company for the year ended June 30, 1932. This was at the same rate as the dividend paid in 1931.

Alexander H. Kerr & Company, Inc., Sand Springs, Okla., manufacturers of fruit and jelly glass jars, bottles and tumblers will establish a factory at Huntington, W. Va., to employ from 75 to 100 workers.

H. T. Stebbins, service manager of the local plant of the Owens-Illinois Glass Company, according to a Charleston, W. Va., report, has been appointed to take charge of the company's Kanawha City factory now idle.

Frank Bostock of Sapulpa, Okla., has taken over the management of the National Flat Glass Company at Independence, Kans., for the receiver of the company.

New Publications

The Wilson-Maeulen Pyrometer Division of the Foxboro Company, Foxboro, Mass., has issued a new bulletin, 182, completely describing the new line of potentiometer control pyrometers, manufactured by this Division. This is a 16-page publication, with

cover, and with a brief introduction on the function of the automatic temperature controller and the essentials in control equipment. Their potentiometer control pyrometers for use with thermocouples, and the automatic type with mercury switch contacts and also with external drive unit, and several other types of apparatus are described. Copy of this bulletin may be obtained upon request from the manufacturers.

Simplified Practice Recommendation, R123-30, Carbonated Beverage Bottles, which went into effect September 1, 1930. Issued March 14, 1932, in pamphlet form and is now for sale by the Superintendent of Documents, Washington, D. C. Price 10 cents.

A report of the U. S. Geological Survey on the non-metallic mineral resources of Eastern Oregon by Bernard N. Moore has been issued by the Department of the Interior. The report covers asbestos, diatomaceous earth, limestone and pumice.

Coming Meetings

The National Glass Distributors Association, Eastern Division, will meet at Atlantic City, September 14-16. Secretary Carl F. Doerr has arranged for a luncheon on September 15 and for the usual golf tournament to open on September 16. Buses for the golf course will leave the Hotel Traymore on Friday, September 16, at 9 a. m.

The Western Division will hold a meeting in Chicago, September 26 and 27.

The American Bottlers of Carbonated Beverages will hold its annual meeting and exposition at Cleveland, O., beginning November 14.

The 21st Annual Safety Congress and Exposition will be held in Washington, D. C., October 3-7.

Recent Deaths

Dr. Lucius L. Ball

Dr. Lucius L. Ball, for many years connected with the Ball Brothers Glass Manufacturing Company, Muncie, Ind., died late in July.

Albert J. Doerr

Albert J. Doerr, who for a long period was president of the Doerr Glass Company, Vineland, N. J., died suddenly on Thursday, August 11.

Samuel J. Carr

Samuel J. Carr, one of the founders of the Carr-Lowrey Glass Company of Baltimore, Md., died at the Marlborough-Blenheim Hotel, Atlantic City, on August 10. Mr. Carr was a native of Baltimore; he was born there in 1854.

Carl R. Harmon

Carl R. Harmon, secretary and sales manager of the Rodefer Glass Company, died in a Cleveland hotel on August 5. He had gone to Cleveland on a business and pleasure trip.

Inquiries Received

For further information address THE GLASS INDUSTRY

573. Please give us the names of manufacturers of prismatic pressed lenses.

574. We are in the market for a good used optical pyrometer.

575. Where can we obtain veneered packing poxes for glassware?

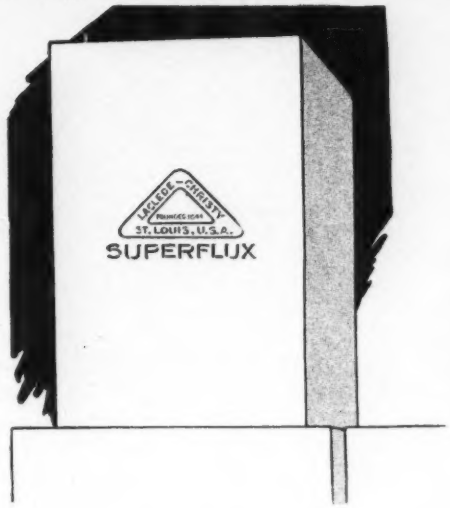
576. We are in the market for a good used optical pyrometer such as Pyro or Fisher and Foote. Can you advise where such equipment might be obtainable?

577. Where can we obtain veneered packing boxes?

578. Please furnish me with addresses of firms which manufacture machines to make small cylinder glass beads.

579. Will you kindly give me the names of some companies who make thick annealed plate glass?

Performance *talks*



"Over 24 Months' Constant Service!"

The Greensburg Glass Works, Greensburg, Pa., write: "We have used Laclede-Christy SUPERFLUX Blocks in our continuous tanks for quite a few years. Our No. 2 tank to date has been in constant operation, producing quality glass at better than rated capacity for over 24 months. And as yet we are not planning to repair this unit."

Plant conditions and practices may vary, but whatever *yours* are, you can be absolutely sure that Superflux Blocks will give you the very maximum of service. This also applies to Buckeye Blocks, now made by Laclede-Christy.

Let us fill an order for you right now—we can deliver on *quality*, *service*, *price*.

LACLEDE-CHRISTY, ST. LOUIS, U. S. A.

P2

SUPERFLUX BLOCKS

A LACLEDE-CHRISTY PRODUCT

Current Prices of Glass-Making Materials

August 22, 1932

Quotations furnished by various producers, manufacturers and dealers.

Acid	Carlots	Less Carlots
Citric (dom.) lb.	..	.29
Hydrochloric (HCl) 20° tanks, per 100 lb	..	..
Hydrofluoric (HF) 60% (lead carboy) lb	..	.12½
52% and 48% lb.	.10	.10-.11½
Nitric (HNO_3) 38° carboy ext. Per 100 lb.	5.50	..
Sulphuric (H_2SO_4) 66° tank cars ton	15.50	..
Tartaric lb.	..	.23½
Alconol, denatured gal.	..	..
Aluminum hydrate ($Al(OH)_3$) lb.	.04½-.05	.05½-.06
Aluminum oxide (Al_2O_3) lb.	..	.07
Ammonium bifluoride (NH_4) FHF lb.	..	.15½
Ammonia water (NH_4OH) 26° drums lb.	..	..
Antimony, metallic (Sb) lb.	.02½	.02¾
Antimony oxide (Sb_2O_3) lb.	..	.09½
Antimony sulphide (Sb_2S_3) lb.	..	.08½
Arsenic trioxide (As_2O_3) (dense white), 99% lb.	.. .04	.14 .04½
Barium carbonate ($BaCO_3$), Crude, (Witherite) 90%, 99% through 200 mesh ton	47.00	..
90% through 100 mesh ton	44.00	..
Barium hydrate ($Ba(OH)_2$) lb.	..	.05¼
Barium mixture, glassmaker's, f.o.b. St. Louis ton	25.00	..
Barium nitrate ($Ba(NO_3)_2$) lb.	..	.07¼
Barium selenite ($BaSeO_3$) lb.	..	..
Barium sulphate, in bags ton	19.00	24.00
Barium sulphate, glassmaker's, carlots, bulk, f.o.b. shipping point, ton	15.00-16.00	18.00
Bone ash carlots, lb	.06	.06½
Borax ($Na_2B_4O_7 10H_2O$) lb.	..	.02¼-.02¾
Granulated lb.	.02-.02½	.02¼-.02¾
Powdered lb.	.02¼-.02¾	..
Boric acid (H_3BO_3) lb.	.04¼-.05¼	..
Cadmium sulphide (CdS)—		
Red lb.	..	.65-.90
Orange lb.	..	.60-1.10
Yellow lb.		1.30-1.50
Chromium oxide (Cr_2O_3) lb.	.18½	.19
Cobalt oxide (Co_3O_4)		
In bbls. lb.	..	1.25-1.45
In 10 lb. tins lb.	..	1.35
Copper oxide		
Red (Cu_2O) lb.	..	.25
Black (CuO) lb.	..	.17-.19
Black prepared lb.	..	.22
Cryolite ($Na_3Al F_6$) Natural Greenland Kryolith) lb.	.09	.09¼
Synthetic (Artificial) lb.	..	.09½
Epsom salts ($MgSO_4$) (imported) Per 100 lb	..	1.15-1.20
*Feldspar—		
100 mesh ton	11.50-17.50	12.00-18.00
80 mesh ton	11.00-11.50	13.00
40 mesh ton	10.75-11.00	12.00
20 mesh ton	9.50-11.00	..
Fluorspar (CaF_2) domestic, ground, 96-98% (max SiO_2, 2½%)		
Bulk, carloads, f.o.b. mines ton	30.00	..
In bags or barrels ton	34.00	39.00
Imported ton	30.00-31.00	33.00-37.00
Formaldehyde lb.	..	.07
Graphite (C) lb.	..	04-.07
Iron oxide—		
Red (Fe_2O_3) lb.	..	.0425
Black (FeO) lb.	.04½	..
Kaolin (f.o.b. mine) ton	8.00-9.00	..
English, lump, f.o.b. New York ton	14.50-25.00	24.50-30.00

*Spot Shipments

Kryolith (see Cryolite)	Carlots	Less Carlots
Lead cnromate ($PbCrO_4$) lb	..	.30
Lead oxide (Pb_3O_4) (red lead) lb.	.058	.0675
Litharge (PbO) lb.	.048	.0575
Lime—		
Hydrated ($Ca(OH)_2$) (in paper sacks) ton	5.50	..
Burnt (CaO) ground, in bulk ton	5.00	..
Burnt, ground, in paper sacks ton	7.00	..
Burnt, ground, in 280 lb. bbls. Per bbl.	2.15	..
Limestone ($CaCO_3$)	1.50-2.50	..
Magnesia (MgO)—		
Calcined, heavy (in bbls.) lb	.06	.07
light (in bbls.) lb.	..	.23
extra light (in bbls.) lb.	..	.37
Magnesium carbonate ($MgCO_3$) lb.	.06	.10
Manganese 85% (MnO_2) lb.	.03	.03
Nickel oxide (Ni_2O_3), black— for nickel content lb.	..	.35
Nickel monoxide (NiO), green— for nickel content lb	..	.35
Plaster of Paris, bags ton	21.00	23.00-29.00
Potassium bichromate ($K_2Cr_2O_7$)—		
Crystals lb	.09	.09¼
Ground lb	.11	.12
Potassium carbonate—94-96% lb.	.0555	.0555
Calcined (K_2CO_3) 96-98% lb	.06¼	.07
Hydrated 80-85% lb.	.05¾	.06¼
Potassium chromate (K_2CrO_4) lb.	..	.25
Potassium hydrate (KOH) (caustic potash) lb	.07½	.08
Potassium nitrate (KNO_3) (gran.) lb	..	.06-.06¼
Potassium permanganate ($KMnO_4$) lb.	.16½	.17½
Powdered blue lb.	..	1.35
Rochelle salts, bbls. lb.	..	.14
Rouge lb.	..	..
Rutile (TiO_2) powdered, 95% lb.	.15-.20	.20-.25
Salt cake, glassmakers (Na_2SO_4) ton	22.00	..
Selenium (Se) lb	..	1.70
Silver nitrate ($AgNO_3$) (100 oz.) per oz	..	.20¼-.20¾
Soda ash (Na_2CO_3) dense, 58%—		
Bulk, on contract Flat per 100 lb	1.05	..
In barrels Per 100 lb	1.38	1.90-2.13
In bags Per 100 lb	1.17½	1.72½-1.92½
Spot orders .025 per 100 lbs. higher		
Sodium bichromate ($Na_2Cr_2O_7$) lb	.07	.07½
Sodium hydrate (NaOH) (caustic soda) Solid Per 100 lb	2.50	..
Sodium nitrate ($NaNO_3$)—		
Refined (gran.) in bbls. lb	..	..
95 per cent. Per 100 lb	1.67-177	1.72-1.82
Sodium selenite (Na_2SeO_3) lb	..	2.00
Sodium fluosilicate (Na_2SiF_6) lb.	.05½	.06
Sodium uranate (Na_2UO_4) Yellow or Orange lb.	..	1.50-1.55
Sulphur (S)—		
Flowers, in bbls. Per 100 lb	3.45	3.80-4.00
Flowers, in bags Per 100 lb	3.10	3.45-3.65
Flour, heavy in bbls. Per 100 lb	2.85	3.20-3.40
Tin chloride ($SnCl_2$) (crystals) lb	.37½	.39
Tin oxide (SnO_2) in bbls. lb	.28	.29½
Uranium oxide (UO_2) (black, 96% U_3O_4) 100 lb. lots. Black lb	..	2.75
Yellow lb	..	1.50
Zinc oxide (ZnO) lb.	.08½	.12
American process. Bags lb.	.05¾	.06
Zircon		
Granular (Milled .005-.02c higher)	.07	.07½-.08
Crude. Gran. (Milled .005-.02c higher)	.03½	.04-.05

Monthly Summary of United States Foreign Commerce in Glass

EXPORTS

Corrected to July 25, 1932.

	June 1931 Quantity	June 1931 Value	June 1932 Quantity	June 1932 Value	Six Months Ending June 1931 Value	Six Months Ending June 1932 Quantity	Six Months Ending June 1932 Value
Glass and glass products (Total)	.....	$563,517	.....	$341,351	$3,998,263	.....	$2,242,736
Plate and window glass—							
Window glass, common, box 50 sq. ft.	297	1,995	64	608	4,292	23,053	830	5,229
Plate glass, unsilvered, sq. ft.	260,680	81,947	215,030	63,160	2,269,078	697,666	1,743,913	486,600
Other window and plate glass lbs.	168,006	16,135	33,458	5,840	1,707,531	183,818	563,436	71,526
Glass containers (bottles, vials and jars)	.....	157,976	.....	109,482	.....	1,115,226	.....	583,219
Table glassware, plain	.....	55,243	.....	40,127	.....	488,094	.....	265,581
Table and other glassware, cut or engraved	.....	6,111	.....	3,605	.....	45,386	.....	23,470
Lamp chimneys and lantern globes lbs.	.....	9,214	.....	2,997	.....	54,985	.....	35,220
Globes and shades for lighting fixtures lbs.	.....	34,549	.....	19,173	.....	234,368	.....	114,398
Chemical glassware lbs.	12,869	11,689	12,122	8,446	76,512	76,256	55,276	50,871
Electrical glassware, except for lighting lbs.	295,641	14,947	30,885	2,408	903,746	58,953	515,896	23,863
Other glassware	.....	173,711	.....	85,505	.....	1,020,458	.....	582,759

IMPORTS

Corrected to July 25, 1932.

Glass and glass products	.....	$475,909	.....	$266,885	.....	$3,004,525	.....	$1,606,450
Cylinder, crown, and sheet—								
Plain dut. lb.	531,587	17,141	312,603	8,797	4,423,395	169,873	1,623,590	54,524
Bent, beveled, colored, etc. dut. lb.	189,448	21,915	70,296	10,396	1,065,170	139,296	471,287	78,784
Plate glass dut. sq. ft.	475,853	88,838	113,840	28,287	2,644,550	739,077	771,181	145,027
Glass mirrors	134	227	86	248	810	1,884	3,442	2,800
Rolled, cylinder, crown, and sheet glass, ground, obscured, bent, beveled, colored, etc	.....	2,588	.....	4,511	.....	29,448	.....	44,847
Laminated glass and manufactures, and plated glass	.....	9,174	.....	130	.....	13,256	.....	3,115
Bottles, vials, jars, and other containers	.....	32,047	.....	34,170	.....	247,164	.....	160,590
Scientific articles and utensils dut.	.....	37,552	.....	27,379	.....	198,774	.....	143,664
Tubes and rods dut.	.....	12,580	.....	5,722	.....	60,790	.....	38,020
Illuminating articles dut.	.....	32,613	.....	16,108	.....	188,508	.....	95,348
Blown glass articles—								
Bulbs for electric lamps, without filament dut.	4,117,873	9,176	824,784	8,807	7,237,431	69,061	6,450,673	53,988
Other blown glass articles dut.	.....	119,097	.....	66,030	.....	652,660	.....	421,596
Pressed glass articles	.....	8,397	.....	6,609	.....	59,345	.....	53,561
Other glassware	.....	84,564	.....	49,691	.....	435,389	.....	310,586